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SOILS OF THE EASTERN UNITED STATES AND THEIR USE—XXIV.

THE ORANGEBURG SANDY LOAM.

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SOILS OF THE EASTERN UNITED STATES AND THEIR USE—XXIV.

THE ORANGEBURG SANDY LOAM.

GEOGRAPHICAL DISTRIBUTION.

The Orangeburg sandy loam is found in both the Atlantic and Gulf Coastal Plain regions, in a large number of scattered localities. The most northern occurrences are to be found in the central portion of South Carolina, where the type is extensively developed. Additional areas are found in southwest Georgia and adjoining portions of Florida and Alabama. The greatest development of the type, however, is found in southern and central Alabama, in scattered areas occurring in different portions of Mississippi, and in considerable areas in the extreme northwestern portion of Louisiana. There are a few scattered and unimportant areas in Texas.

During the progress of soil-survey work the Orangeburg sandy loam has been encountered in 28 different areas located in 7 States, and has been mapped to the total extent of 507,648 acres. Since only about one-seventh of the total area of the Coastal Plain region has been covered by soil surveys, it is safe to estimate that between 3,000,000 and 3,500,000 acres of this type will ultimately be found in the region named. Of the area already surveyed, fully three-fifths lies in the State of Alabama alone, and four-fifths of all of the type yet encountered in Alabama, Louisiana, and Mississippi. South Carolina is the only other State which possesses any appreciable area of the Orangeburg sandy loam.

CHARACTERISTICS OF SOIL AND SUBSOIL.

The surface soil of the Orangeburg sandy loam to an average depth of 6 or 8 inches is a gray or brown sandy loam. There is considerable variation in the texture of the surface soil and the material at the immediate surface may in many instances be a medium gray sand, underlain at no great depth by a gray or brown loamy sand. In other instances the surface material is a finer grade of sand, somewhat loamy in its structure. This surface material grades downward into a red sandy clay, which at greater depths is succeeded by a stiff red clay. The total depth of surface soil and subsoil material is almost

always in excess of 3 feet, and considerably greater depths are attained in the larger areas. Upon the more elevated portions of the type the surface soil is frequently gray, with accumulations of medium sand. Upon the slopes the type is apt to be more loamy in its surface characteristics, while at the foot of the slope, or in certain slight hollows within the area of the type, there is usually some accumulation of organic matter, with the surface soil a darker brown and more loamy in character. These variations are due almost entirely to the effect of soil erosion and deposition over the cultivated fields.

The Orangeburg sandy loam is easily distinguished from members of the Norfolk series through the fact that the subsoil is always red. It is distinguished from the sandy loam of the Greenville series from the fact that the latter series is red in the entire section from the surface down. It is easily distinguished from the soils of the Susquehanna series in that their subsoils are always stiff, plastic clays. The Orangeburg sandy loam is very closely related to the Orangeburg fine sandy loam in all respects except the texture of the surface soil. The subsoils are almost identical, but the surface soil of the Orangeburg sandy loam is usually coarser grained and more porous than that of the fine sandy loam. This characteristic gives rise to certain distinctions in the crop adaptation and methods of treatment to be practiced upon the two types.

SURFACE FEATURES AND DRAINAGE.

In the majority of areas where the Orangeburg sandy loam is encountered its surface is rolling to hilly, with many steep slopes. In certain areas of considerable agricultural importance the declivities within the area of the type are less, and the surface must be characterized as rolling to gently sloping. These latter areas are the ones which constitute the most valuable agricultural lands.

Practically none of the areas where the type is strongly developed lies at an altitude of less than 100 feet above tide level. All of the more inland areas in central Alabama, in northern Louisiana, and in northeastern Texas lie at altitudes from 150 to 350 feet above tide level, with some exceptional areas near the inland border of the Coastal Plain which reach altitudes of nearly 500 feet. Thus there is considerable difference both in the elevation and the topography of the different localities where the Orangeburg sandy loam is typically developed. These differences have a direct effect upon the drainage and erosion characteristics of the soil type, and consequently upon the crop adaptations and the extent to which it may be cultivated.

Throughout its entire area the Orangeburg sandy loam is well drained. In fact, in the more rolling sections it is liable to be excessively drained, since the surface sandy soil is not particularly

retentive of moisture in itself and is only enabled to maintain a proper moisture supply for the production of crops through the existence of the underlying sandy clay subsoil. There are no swampy areas within the extent of the type.

Surface drainage is so rapid in certain of the more hilly and sloping portions of the type that erosion constitutes a very serious problem. Practically no slopes of greater than 10° declivity should be planted to intertilled crops. Instead they should be used for pasturage, after having been covered with Bermuda grass, lespedeza, or some other sod-forming grass. Upon the more steeply sloping portions of the type forestation is practically the only remedy for excessive erosion which has already been incurred or the only protection for spots now threatened. Even upon the more gentle slopes, within areas at present cultivated, there are certain precautions which must be observed in the tillage of this soil.

LIMITATIONS IN USE.

On account of the somewhat coarse texture of the surface soil of the Orangeburg sandy loam, it absorbs readily the moisture which falls upon it. Because of the same textural peculiarity, this soil moisture is rapidly drained away into the subsoil and the surface soil is soon dried. When this action is not too rapid, nor too complete, a favorable condition for crop production is secured. The soil is well drained and easily tilled. It is usually a warm soil, and only moderately subject to drought.

The crops best suited to the Orangeburg sandy loam are cotton and corn. Winter oats are also fairly well adapted to production upon this type, which is a medium to good soil for three of the great staples of southern agriculture. It is not so well suited to the production of any special crop with the possible exception of cigar-filler tobacco and peaches, together with such truck crops as Irish potatoes, sweet potatoes, tomatoes, watermelons, and cantaloupes.

The productiveness of the Orangeburg sandy loam is probably limited to the greatest degree by lack of organic matter in the surface soil of the tilled fields. This is a prevailing deficiency of this and similar sandy types in the Southern States. Because of its physical properties all of those processes which result in the complete destruction of organic matter are accelerated by the continual cultivation of the type to intertilled crops. As a result, the moisture-holding capacity of the soil has been decreased through the destruction of the organic matter content.

Since the principal areas of the Orangeburg sandy loam lie within the warm temperate region and within a region of abundant rainfall, the type is best suited to the production of the crops common to the more Southern States. Wheat or the northern grasses are not

advisable upon the type, and cotton, corn, and oats should constitute the principal staple crops.

IMPROVEMENT IN SOIL EFFICIENCY.

Erosion is probably the greatest mechanical difficulty which is experienced in the conduct of agricultural operation upon the Orangeburg sandy loam. Only the more moderate slopes to be found within the type should be cleared and occupied for agricultural purposes. Any slope in excess of 10° of declivity is too great to permit of the long-continued production of intertilled crops. Many thousands of acres of the type possess slope of this degree, and of even greater declivity, limiting the area which may be used for agriculture. Areas of greater slope should be occupied only for the production of permanent pasture grasses suited to the attendant climate or, in the case of the steepest slopes, for reforestation and the production of wood and lumber.

In all cases where the slope is at all steep the plow furrows and the rows of the intertilled crop should be carried around the slope of the hill in the form of contour cultivation, and terraces should be left at frequent intervals to grow up to grass, in order that there may be no long, steep slopes across the tilled field, and that such surface water as does move down the slope may frequently be intercepted by the terrace line. In addition to these precautions it is necessary to incorporate additional amounts of organic matter both to absorb the rainfall and to add coherence to the surface soil. In all cases winter cover crops should be employed in the tillage of this type.

Chief among the cover crops are the legumes, such as crimson clover, which may be grown in all of the more elevated localities where the type occurs; cowpeas, which may be universally grown upon the type; the velvet bean, which has its habitat in southwest Georgia, southeast Alabama, and western Florida; lespedeza, at present confined largely to Alabama and Mississippi; and such nonleguminous crops as winter oats, and even winter rye, which may be grown in practically all of the localities where the type is found.

Succeeding a crop of cotton, winter oats should be sown upon the land. Succeeding a crop of corn, or better yet, between the rows, some such crop as cowpeas or hairy vetch should be sown. In both instances the matted vegetation of the cover crop will tend to prevent erosion during the heavy rains of winter and early spring, while a valuable forage crop may be produced when the land would otherwise be idle.

Wherever possible, one of these crops should be sown upon the Orangeburg sandy loam to occupy the surface during the entire period of the winter months. In this way a considerable benefit

is derived from the protecting mat of surface vegetation and of plant roots, and destructive erosion is decreased.

In addition, a considerable growth of green-manuring material may be made during the fall and spring months and, in the more southern localities, even during the winter months. In the succeeding spring this may be turned under to a depth of 5 or 6 inches, and thoroughly incorporated with the surface soil, furnishing, in its decay, the much needed organic matter content. In many instances, especially where the sandy clay subsoil approaches near to the surface, it would be well to add lime to the extent of 1,500 or 2,000 pounds per acre after turning under the green-manure crop. The burned stone lime, slaked in the field and broadcasted over the surface of the type and then harrowed in thoroughly, will be most effective in promoting this necessary decomposition. Where such treatment is omitted, difficulty is occasionally experienced through the accumulation of large masses of partly decomposed organic matter at shallow depths. The presence of such material prevents the proper root development of the succeeding crop, frequently reducing instead of increasing the crop yield. Wherever the prompt decay of the organic matter is secured through the application of lime, this method of restoring this element to the soil is probably the best and most expedient which may be adopted.

Those methods of tillage of the Orangeburg sandy loam should be adopted which tend toward the maintenance of an adequate supply of soil moisture in the surface soil. In consequence the depth of plowing should be increased from the prevailing average of not over 3 inches to 8 or 9 inches. This should be done gradually by increasing the depth of plowing about 1 inch each time the ground is broken. Increase in the depth of plowing will enable the surface soil to absorb and retain a larger amount of moisture during the winter and spring rains and will assist in the prevention of erosion.

For the subsequent tillage of the crop too much stress can not be laid upon the frequent and the shallow cultivation of the surface soil. By such operations a thin covering or dust mulch is formed which is almost perfectly dry. This interposes between the soil moisture and the atmosphere above a covering which prevents excessive evaporation. During the earlier part of the season it is not so essential that the cultivation should be shallow, but as the crop roots are pushed out into the middle of the rows this practice should be more steadfastly adhered to lest the surface feeding roots be destroyed by deeper cultivation and the ability of the crop to secure the available supply of soil moisture thereby lessened.

Only those areas of the Orangeburg sandy loam which possess at present an adequate supply of organic matter should be selected for the production of corn. Otherwise the yields per acre are likely to

be unsatisfactory, since this crop is not sufficiently drought resisting to compete with cotton upon the drier portions of the type.

LIMITATIONS UPON SPECIAL CROPS.

The Orangeburg sandy loam is second only to the Orangeburg fine sandy loam as a peach-orcharding soil in the South Atlantic and Gulf States. It is necessary in the selection of orchard sites to secure those which are moderately sloping, and which possess some elevation above the adjoining land, in order that both air and water drainage may be adequate. At the same time the more hilly portions of the type which are subject to excessive erosion must be avoided. The Elberta is the principal peach grown upon this type, although other similar varieties have been less extensively planted. Transportation facilities are also an important consideration in the selection of orchard sites.

The Cuban type of cigar-filler tobacco is grown successfully upon the Orangeburg sandy loam in Florida, Georgia, Alabama, and Texas. Locations selected for this crop should be nearly level, and the surface sandy soil should not have a depth greater than 8 or 9 inches, in order to produce large crops of the leaf. It is also essential that locations well supplied with organic matter should be chosen, or that this material be restored to the soils before the most successful crops can be grown. Those portions of the type underlain by the greensand or "gunpowder" marls, are particularly desirable for tobacco production.

Portions of the type possessing the deeper sandy soil ranging from 9 to 15 inches in depth should be chosen for the production of truck crops. The greater depth to clay gives a warmer, earlier seed bed, and brings about the early maturity of the crop. In all cases where areas of the Orangeburg sandy loam are devoted to the production of special crops, particular care should be taken to prevent erosion and to restore organic matter to the surface soil.

EXTENT OF OCCUPATION.

Wherever the Orangeburg sandy loam is possessed of a nearly level or gently sloping surface it has been cleared and occupied for the production of crops, particularly in the south Atlantic and eastern Gulf regions. The steeper slopes and the more hilly portions of the type still remain in timber or have been excessively eroded where the timber stand has been removed. In general, the type has been recognized as an excellent upland cotton soil, and as such nearly all available areas in the more eastern States have been sought out for occupation. In northern Louisiana and in eastern Texas there still remain large areas of the type from which the native growth

of pine has been cut in recent years and these are being rapidly occupied for general farming purposes. In the northeastern portions of Texas peach orcharding is also being established as one of the principal industries upon the Orangeburg sandy loam.

There are many thousands of acres of the type which may still be occupied for the production of crops, particularly in the regions west of the Mississippi River. There are also considerable areas of the type now occupied for agricultural purposes, which because of a steep slope and excessive erosion should no longer be used for the production of tilled crops, but should be devoted to pasturage or, in extreme cases, reforested.

CROP ADAPTATIONS.

Throughout the region where the Orangeburg sandy loam has been developed agriculturally cotton is the dominant crop. In the majority of areas where it has been encountered the common opinion of the farmers is that this soil is better suited to cotton growing than to the production of corn. This is usually explained by the fact that cotton is more resistant to drought and is capable of continuing its growth and fruiting during the late summer months at a time when corn not infrequently suffers from lack of moisture. It is probable that the prevalent methods of cultivation are also better suited upon such a sandy soil to the production of cotton than of corn. There is a wide variation in the yield of cotton secured upon the Orangeburg sandy loam, dependent chiefly upon the degree of efficiency with which the soil is prepared and cultivated. Upon the areas having a deeper sandy surface soil, especially where the organic matter has been depleted through long years of one-crop tillage, the yields of cotton are two-fifths of a bale or less per acre. In the same communities fields where crop rotation, the restoration of organic matter, and proper tillage have been employed frequently yield from one-half to three-fourths of a bale per acre, and under the most favorable circumstances yields of over one bale per acre have been reported.

The recommendations for the general treatment of the type apply with full force to the production of cotton, and it may be stated with confidence that the prevention of erosion, the restoration of organic matter, deeper plowing, and shallow intertillage are requisites for increased yields of cotton upon this and similar sandy types of upland cotton soils.

The acreage annually planted to corn upon the Orangeburg sandy loam is considerably less than that devoted to cotton. Difficulty is experienced with midsummer droughts under the usual methods of tillage, and the yields of corn are generally low, ranging from 10 to 15 or 20 bushels per acre. The latter yields are fre-

quently exceeded by the best farmers, and 25 to 30 bushels of corn per acre may be produced upon the shallower phase of the Orangeburg sandy loam, where the clay is encountered at a depth of not more than 6 or 7 inches and where there is sufficient organic matter in the surface soil.

In general, the brown-colored surface soil, indicating abundant organic matter, should be chosen for corn production, and locations where the deep, mellow, loamy surface soil has accumulated at the foot of adjacent slopes are particularly favorable to large yields. Similarly small hollows and depressions within the surface of the type, which are fairly but not excessively drained, are found to give large yields when the crop is properly tended. With the adoption of proper methods of cultivation, similar to those advised for cotton, but with particular stress laid upon the use of green manures and of organic fertilizers, yields of corn upon this soil may be considerably increased.

Winter oats is the other principal crop of general production on the Orangeburg sandy loam. It is usually cut for forage purposes, and only a small proportion of the total acreage of oats is harvested for grain. The yields range from 15 to 30 bushels per acre, dependent upon the condition of the soil. This could be materially increased by broadcast plowing of the land and the thorough smoothing of the surface soil by repeated harrowings before the oats are seeded. In too many instances the fields are poorly plowed and imperfectly harrowed, if at all. As a result the stand of oats is not uniform and the crop is poor. Winter oats should be more generally grown to follow the corn crop, both for forage and for the purpose of covering the land with vegetation during the winter months.

Cowpeas are coming to be more extensively grown, both as a forage crop and as a winter cover crop, to be used for green manuring. The yields of hay secured range from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons per acre, and the cowpea constitutes one of the best forage plants for production upon this soil. It may be used not only as hay, but also for grazing purposes, or to be plowed under for the restoration of organic matter to the soil. Cowpeas are sown between the rows of corn at the last working of that crop, either for green manuring purposes or for early spring grazing. When produced for hay the crop is usually spring sown upon land especially prepared for it. In certain localities in southern Georgia, northern Florida, and southeastern Alabama the velvet bean is also used to some degree in the same way. In more northern locations crimson clover might be similarly employed to advantage. To a limited extent winter rye and winter wheat are grown upon this type for forage purposes. Neither crop

is equal in value or in yield to the leguminous crops already mentioned.

Special crops.—The Cuban type of cigar-filler tobacco is coming to be raised upon the Orangeburg sandy loam in Florida, Georgia, Alabama, and eastern Texas. The type ranks next to the Orangeburg fine sandy loam for the production of this grade of tobacco. It has been found in the Florida, Alabama, and Texas areas that portions of the type of average fertility may be profitably planted to this crop, and that yields of 600 to 800 pounds per acre of an excellent quality of leaf are produced. With deep plowing, the abundant use of organic manures, and heavy applications of special commercial fertilizers these yields have been considerably increased. The Orangeburg sandy loam and fine sandy loam are the best soils for the production of this tobacco which may be found in the southern United States. There are considerable areas of the Orangeburg sandy loam which might well be occupied for tobacco growing, especially in southern Alabama and in eastern Texas.

The Orangeburg sandy loam is also well suited to peach orcharding and this industry is rapidly increasing in extent, particularly in northeastern Texas. It is requisite that transportation facilities should be adequate, that drainage conditions should be excellent, and that locations of some elevation, although of not too great slope, should be selected. The fruit produced is usually highly colored, and of good flavor. The trees come to early maturity and are reasonably long lived, provided the depth of surface sandy soil is not too great. In general the shallower phase of the type where the clay is encountered at a depth of not more than 8 or 9 inches should be selected.

While not preeminently a truck soil, the Orangeburg sandy loam is fairly well suited to the production of certain vegetable crops. Among these, early Irish potatoes, sweet potatoes, water melons, cantaloupes, and tomatoes are most successfully grown. For the production of these truck crops the deeper phase of the type should be chosen where the surface sandy covering has a total thickness of 15 inches to 2 feet. This insures a well drained, warm seed bed and assists in forcing the crop to early maturity. Considerable areas of the Orangeburg sandy loam, well located with respect to transportation, still remain in both the South Atlantic and Gulf States which might well be occupied for market-garden and trucking crops.

Sugar cane for the manufacture of table sirup is grown to some extent upon this soil in the immediate vicinity of the Gulf of Mexico. The yields are good, but the sirup is usually a little darker in color than that made from cane grown upon the soils of the Norfolk series.

The Orangeburg sandy loam may be characterized as a good upland soil, which is also fairly well suited to the production of cotton,

corn, and oats. Its use for special crops is somewhat limited, and aside from the Cuban type of cigar-filler tobacco and the Elberta peach there are no special crops which have as yet been securely established for production upon this soil. It can scarcely compete with the more sandy soils of the Orangeburg series or the Norfolk series in the production of early truck, although it has a distinct value in the growing of vegetables for the local market and for the home supply.

FARM EQUIPMENT.

The incoherent, sandy surface soil of the Orangeburg sandy loam is easily and adequately worked by the lighter weight equipment of farm stock and farm machinery prevalent in the districts where it occurs. Usually crop production is aided by the deeper plowing of this soil and the two-horse moldboard plow or disk plow should be more generally used than at present. For the subsequent intertillage of the crops, the spike-tooth or spring-tooth cultivator and the sweep should be used in preference to the light-weight turning plow. The former implements are capable of removing all weeds upon properly prepared land and of maintaining the surface dust mulch which aids in the retaining moisture enough for the nourishment of the crop during the summer months. They do not, as in the case of the turnplow, cut off the feeding roots of the cotton or the corn, thereby reducing their resistance to drought.

Usually there is no elaborate equipment of outbuildings upon the farms and plantations whose soil is principally Orangeburg sandy loam. Only the work stock and a small number of cattle are maintained upon the farm, and no elaborate equipment for the storage of forage crops is required. The usual farm equipment is not markedly different from that used upon other associated types.

SUMMARY.

The Orangeburg sandy loam is an extensive and important general farming soil found in the south Atlantic and Gulf Coastal Plain regions.

It is particularly well suited to the production of Upland cotton and is also a fair corn and winter oat soil. These constitute the principal crops grown upon the type with the exception of cowpeas, velvet beans, and crimson clover, grown as cover crops and for forage.

The Cuban type of cigar-filler tobacco is successfully grown upon the Orangeburg sandy loam in northern Florida, southern Georgia, southern Alabama, and eastern Texas.

Increasing areas of the type are being planted to peaches, chiefly the Elberta. The fruit produced is of good quality, and the trees when located upon properly selected sites are long-lived and thrifty.

The type is not especially well suited to the production of trucking crops, but early Irish potatoes, sweet potatoes, cantaloupes, watermelons, and tomatoes are successfully grown upon the phase possessing a depth of 15 inches or more of sandy or sandy loam surface soil.

The Orangeburg sandy loam may be chiefly benefited by the restoration of organic matter to the surface soil, by deeper plowing in the majority of instances, by shallow and frequent intertillage of the crops, by the production of winter cover crops for green manuring purposes, and by the introduction of proper crop rotations.

The steeper sloping areas within the type must be protected from destructive erosion by terracing and contour farming, while the steepest slopes should either be put permanently into grass for grazing purposes or should be reforested.

In the more eastern States all of the areas of the type whose surface configuration will permit are usually occupied for the production of general farm crops. West of the Mississippi River extensive areas favorably situated for agricultural occupation are still available.

The Orangeburg sandy loam may be characterized as a fair to good general farming soil, which is also suited, under special conditions, to the production of filler tobacco, peaches, and certain market-garden vegetables.

Approved.

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *September 26, 1911.*

APPENDIX.

The following table shows the extent of the Orangeburg sandy loam in the areas surveyed to this time.

In the first column is stated the particular soil survey in which the soil was encountered; in the second column its extent of development in acres; and in the third column the volume of the Field Operations of the Bureau of Soils in which the report upon the area may be found. Those desiring a detailed description of the soil and of the general conditions which surround it in any particular area may consult these volumes in almost any public library.

Areas of the Orangeburg sandy loam encountered in the soil survey.

Survey.	Area of soil.	Year of publication, Field Operations.	Survey.	Area of soil.	Year of publication, Field Operations.
Alabama:	*Acres.*		Mississippi:	*Acres.*	
Autauga County	39,232	1908	Jasper County	52,992	1907
Butler County	3,264	1907	McNeill area	7,296	1903
Coffee County	3,904	1909	Pontotoc County	21,568	1906
Hale County	10,880	1909	South Carolina:		
Henry County	85,888	1908	Darlington area[1]	6,592	1902
Lamar County	9,920	1908	Lee County	29,696	1907
Lee County	128	1906	Orangeburg area	16,064	1904
Macon County	110,144	1904	Saluda County	7,808	1909
Montgomery County	22,912	1905	Sumter County	12,160	1907
Tallapoosa County	5,504	1909	Texas:		
Florida:			Paris area	12,224	1903
Escambia County	17,024	1906	Robertson County	1,728	1907
Georgia:			Woodville area	1,152	1903
Grady County	1,024	1908			
Thomas County	1,344	1908			
Tift County	960	1909			
Louisiana:					
Bienville Parish	24,960	1908			
Caddo Parish	1,088	1906			
De Soto Parish	192	1904			

[1] Mapped as Orangeburg loam.

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